# INTRODUCTION

Groundnut (Arachis hypogaea L.) is one of the important legume crops of both the tropical and temperate regions of the world. Groundnut fixes about 60-170 Kg N/ha (Dwivedi, 1980) and thus maintains the fertility of soil. The groundnut seeds yield edible oil, which is used by human being in day-to-day life for the preparation of vegetables etc. The groundnut seeds are rich in protein content and they are used for the preparation of sweets (Candys) and butter. The oil cakes are used as cattle feed and manure being rich in nitrogen content. Thus groundnut is a multiple benefit crop.

Groundnut occupies about 77% of the total area of semi-arid tropics producing 65% of the total production. Asia produces 10.9 million tonnes, Africa produces 5.2 million tonnes, North and Central America produces 1.98 million tonnes and South America 0.8 million tonnes. The major groundnut growing countries in the world are India, China, France, West Africa, Nigeria and U.S.A. The average groundnut production of the leading countries is as follows :

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|---|---|---|
| India | - | 6.2 million tonnes |
| China | - | 2.8 ,, |
| U.S.A. | - | 1.8 ,, |
| Senegal | - | 1.0 ,, |
| Nigeria | - | 0.7 ,, |
| Sudan | - | 0.8 ,, |

India has the credit to contribute world's 37% produce which is the highest.

Groundnut in India :

India ranks first in the world in the groundnut area (7.6 million hectares - 40%). However, regarding productivity India ranks 10th in the world (7.3 million tonnes - 33%). Area under cultivation of groundnut had expanded by 134% (from 2.9 to 6.8 million hectares) during the period 50 years i.e. from 1930-31 to 1980-81. The increase in area also resulted in an increase in the production by 72% (from 2.9 million tonnes to 5 million tonnes). During this period the productivity has declined by 27% (from 1003 kg/ha to 736 kg/ha).

Groundnut cultivation in India is mainly confined to ten states viz. Andhra Pradesh, Gujarat, Tamil Nadu, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh, Rajasthan, Punjab and Orissa. The states of Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu and Karnataka have 80% of the groundnut cultivated area and 84% of the production. The remaining 20% area of groundnut cultivation and 16% of the production is scattered in the rest of the country.

Groundnut in Maharashtra :

In Maharashtra groundnut is cultivated in all districts of the State and the total area and production was 7.4 lakh

hectares and 5.7 lakh tonnes respectively. Some of the popular groundnut cultivars in Maharashtra are JL-24 (Phule Pragati), SB-11, Karad 4-11, Kopergaon-1, TMV-10, TG-1 (Vikram), TG-17. Groundnut is cultivated in both Kharif and Rabbi seasons. In Kharif season about 92% of the groundnut is grown under rainfed conditions during the months of May to July, depending upon the monsoon rains. Rabbi groundnut is raised on a limited scale in the areas where winter is not severe and night temperatures do not go below 15°C. In Maharashtra summer groundnut is sown during second fortnight of January to first fortnight of February in irrigated areas.

Since groundnut is major oil seed legumes of India, there are continuous attempts to increase yield and productivity of this crop and mainly they are made by plant breeder. Physiological studies also offer such an opportunity. It is now very well realized that one of the major constraint on groundnut production in the semi-arid tropics is the drought. There are several attempts to find out remedies for the problem of drought. Plant breeders are trying to develop drought resistant crop varieties through breeding programme while plant physiologists are attempting to develop a physiological strategy to deal with the problem of water stress. Among these strategies, one promising strategy appears to be a pre-sowing drought hardening treatment. This is also called as 'advancing' or 'preconditioning' treatment. The Russian

workers lead by Genkel (1961) made first serious attempt to introduce a method of pre-sowing seed treatment for increasing drought and frost resistance of crop lines. The process first involved a single soaking in water for about 24 hours at 10-25°C and drying to original weight. Later modifications were suggested in repeated cycles of soaking and drying and in using other dilute solutions such as 0.25% $CaCl_2$ with variations in the amount of water or solution added according to the species or variety (May et al., 1962). Since the early reports of Russian workers, beneficial effects of pre-sowing soaking treatments with micronutrients and phytohormones have been evident in number of studies. In this respect the contribution of Indian plant physiologist, J.J.Chinoy and co-workers who standardized ascorbic acid pre-treatment, is quite noteworthy. The work of Khan et al. (1973) has revealed that the preconditioning treatment with organic solvents is highly effective. Henckel (1964) concluded that presowing hardening was the result of extensive physiological reorganization induced by the dehydration process. Protoplasmic colloids showed increase hydrophilic viscocity and protoplasmic elasticity. According to Heydecker (1973) hardening or repeated imbibition of seeds short of radicle emergence, followed by redrying, causes the activation of latest physiological mechanism which enable the resulting plants to withstand certain adverse environmental conditions such as drought and extremes of temperature.

It has been noticed in last few years that not only plant growth promoters are effective in inducing drought resistance in crop plants but the plant growth retardants like chloro choline chloride (CCC) are also capable of making the plants drought resistant (Halevy and Kessler, 1963 in bean plants; Halevy, 1964 in gladiolus plants and Plaut and Halevy, 1966 in wheat). There are few reports which indicate that presowing soaking treatments with growth retardants are capable of inducing drought resistance in plants (Halevy and Kessler, 1963; Halevy, 1964; Plaut and Halevy, 1966). At the same time one must accept all the above reports with caution in the light of remarks "no generalized statement as the effect of presowing seed treatment can be made since the response seems to depend upon the treatment and variety used" by Salim and Todd (1968).

Although induction of drought resistance due to presowing soaking treatment has been noticed by several workers, very few attempts have been made to understand physiological basis of such an effect. Among various plant growth regulators the positive influence of cytokinins on growth and stress tolerance is documented in many studies. There are few reports which suggest promotion of growth and yield of groundnut by growth retardant chloro choline chloride (Gupta, 1975; Rao, 1980; Reddy and Patil, 1981; Gurubaksha Singh and Sharma, 1982). Hence we thought it worthwhile to find out whether presowing soaking with CCC and kinetin can induce drought

resistance in this crop and which physiological parameters relevant to drought resistance are influenced by the pretreatment. The presowing soaking treatment of these two growth regulators was given through distilled water and organic solvent acetone in order to find out whether there is any difference in physiological behaviour under the influence of these two methods. The pretreatment studies with kinetin have been performed with a purpose of comparing the relative effectiveness of a growth retardant and growth promoter and the major emphasis is on CCC pretreatment. For this purpose JL-24 a promising cultivar of groundnut, cultivated in Maharashtra on large scale, was selected.

In order to understand the work regarding basic problems about interactions of groundnut with plant growth regulators and influence of various natural and synthetic growth regulators on various factors such as germinability, vegetative growth, reproductive growth, yield, seed oil content and physiological changes in groundnut is reviewed in detail. It is represented in the first chapter 'Review of Literature'. The second chapter comprises of various methods used to study the different parameters associated with drought resistance in groundnut. The methodology includes colorimetry for analysis of various organic constituents and enzymes, flame photometry and atomic absorption spectrophotometry for analysis of minerals and autoporometric study of stomatal behaviour.

The significant findings of the present investigations are presented and discussed in the light of available literature in the third chapter 'Results and Discussion'. The findings of the present investigation are briefly summarized in the fourth chapter 'Summary and Conclusions'. The literature cited in the thesis is listed in details in the last part of the thesis 'Bibliography'.